

NON-PUBLIC?: N
ACCESSION #: 9511020269
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Dresden Nuclear Power Station, Unit 3 PAGE: 1 OF 5

DOCKET NUMBER: 05000249

TITLE: Unit 3 Scram From Main Generator Load Reject Due to a
Failed Resistor in the Voltage Regulator
EVENT DATE: 09/28/95 LER #: 95-017-00 REPORT DATE: 10/25/95

OTHER FACILITIES INVOLVED: None DOCKET NO: 05000

OPERATING MODE: N POWER LEVEL: 77

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Dale A. Spencer, Plant Engineering TELEPHONE: (815) 942-2920
Ext. 3292

COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: EL COMPONENT: EXC MANUFACTURER: G080
REPORTABLE NPRDS: Yes

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On September 28, 1995, at 2157, while Unit 3 was at 615 MWe with a 10 Mwe/hour ramp up rate to 650 MWe, Unit 3 scrambled from the Main Generator Load Reject due to a Generator trip on Loss of Generator Field current. A resistor was found open circuited in the voltage regulator circuit. The failed resistor was replaced and the voltage regulator was satisfactorily tested. All safety equipment and Group Isolations performed as required. A Group II and III Isolation occurred due to inventory shrink after the scram, but level was restored. A second Group II and III isolation occurred approximately 18 minutes after the scram. This second isolation was caused by an improperly set relief valve on the Reactor Water Cleanup System which hampered attempts to establish vessel blowdown. The relief valve has been reset and a review of relief valve setpoints for similar problems is being performed. The safety

significance of this event is considered minimal.

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END OF ABSTRACT

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EVENT IDENTIFICATION:

Unit 3 Scram From Main Generator Load Reject Due to a Failed Resistor in the Voltage Regulator

A. PLANT CONDITIONS PRIOR TO EVENT:

Unit: 3 Event Date: 09/28/95 Event Time: 2157

Reactor Mode: N Mode Name: Run Power Level: 77%

Reactor Coolant System Pressure: 986 psig

B. DESCRIPTION OF EVENT:

On September 28, 1995, at 2157, while Unit 3 was at 615 MWe with a 10 MWe hour ramp up rate to 650 MWe, Unit 3 scrambled from the Main Generator EL! Load Reject due to a Generator trip on Loss of Generator Excitation TL! voltage. All safety equipment and Group Isolations functioned as required.

In the eight minutes preceding the generator trip, Unit 3 experienced three Generator Voltage Regulator high output alarms, which reset. Starting approximately 30 seconds prior to the generator trip, swings in the Control Room Var indication from -300 to +100 MVars were seen. The Auxiliary Nuclear Station Operator (NSO)(Licensed Reactor Operator) attempted to zero the Automatic Voltage Regulator (AVR) balance meter and transfer the AVR to manual control. The scram signal was received at about the same time the NSO performed the transfer to manual.

Reactor water level decreased as expected after the scram, resulting in a Group II and III isolation at approximately 2158. Level was restored by the Feedwater Level Control System JB!. The Unit 2 Aux NSO then attempted to return the Reactor Water Cleanup (RWCU) CE! system to service, to provide a blowdown path to stabilize the level increase caused by water input from the Control Rod Drive AA! system. At this point, a lifted relief valve in the RWCU system

caused a loss of inventory and the resultant higher than expected decrease in reactor vessel level. At approximately 2215, a second Group II and III isolation was received. Reactor level was subsequently returned to +15 inches within one minute with the Feedwater System.

Troubleshooting performed immediately after the Generator trip included a review of the alarm typer, Sequence of Events Recorder (SER) and Transient Analysis Reporting System (TARS) printouts. This review confirmed that the generator excitation became unstable, and ultimately reached its maximum limit. Upon reaching generator maximum excitation, the generator trip timer initiated and began to time out. Prior to the timer reaching its limit and providing a trip signal to the generator, a trip on loss of generator field was received.

A review of Operator actions in response to the transient were reviewed and found to be proper. This conclusion was supported by an independent review by the Site Quality Verification organization.

At 2214, an ENS notification was made pursuant to 10CFR50.72(b)(2)(ii).

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C. CAUSE OF EVENT:

This report is being submitted pursuant to 10CFR50.73(a)(2)(iv), any event that results in an unplanned manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System (RPS).

Troubleshooting performed on the Generator Voltage Regulator identified an open resistor in the circuitry which provides negative feedback of the Generator Field voltage to the automatic voltage control. The failure of this resistor resulted in normal variations in the Generator field voltage signal being amplified and causing unstable excitation as was observed prior to the scram. The cause of the failed resistor is not known at this time. It is believed that the increasing magnitude of swings in excitation voltage resulted in saturating the Under-Excited Reactive Ampere Limiter (URAL) circuitry to the point where the URAL was unable to overcome the oscillations.

The difficulty raising the RWCU's pressure to the desired level was the result of a prematurely opening pressure relief valve (PRV), 3-1201-180, on the low pressure piping section of the RWCU system. The PRV opened less than the proper setpoint of 160 psig due to the fact that the relief setpoint improperly incorporated a backpressure correction which was stated in procurement documentation. In addition, there was a temperature correction value incorporated in the setpoint which should not have been included. This lack of configuration control resulted in a lower than desired lift setpoint.

D. SAFETY ANALYSIS:

Upon receipt of the Loss of Generator Excitation signal, the generator trip, turbine trip and the resultant reactor scram all took place as designed. Receipt of the turbine trip signal caused the Turbine Stop Valves to go closed which caused a sudden increase in reactor pressure which was controlled by the sequential opening of the Turbine Bypass Valves. With the reactor pressure greater than 45% of rated, the Turbine Stop Valve closure initiated the reactor scram. This scram signal is part of the plant design to protect the vessel and fuel from the sudden pressure increase associated with a loss of normal heat sink (main condenser) beyond Bypass Valve capability. The limiting factor in a main turbine trip from power is the effect on the fuel cladding safety limit. Operating MCPR limits are imposed to preclude exceeding this limit. A main turbine trip from power is analyzed in Section 15.2.3 of the UFSAR as bounded by a trip without bypass availability. Since Turbine Bypass Valves were available during this event, it is considered there were no challenges to the fuel.

A review of the Electro Hydraulic Control (EHC) system's performance and reactor vessel parameters indicated no abnormalities. Therefore, this event had no effect on Reactivity control.

In addition to the High Pressure Coolant Injection and Isolation Condenser Systems BL!, the Automatic Depressurization System SB! was available to reduce the Vessel pressure to allow the Core Spray BM! or Low Pressure Coolant Injection BO! to provide the any needed make-up inventory during this event. Based on the above discussion, the overall significance of this event is considered to be minimal.

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E. CORRECTIVE ACTIONS:

Nuclear Tracking System (NTS) tracking code numbers are identified as (XXX-XXX-XX-XXXXX).

The failed resistor in the Generator Voltage Regulator was replaced prior to restart. The failed resistor will be sent to an offsite laboratory to determine its failure mode. This will be tracked to completion by action item 249-180-95-01701.

Post Maintenance testing and online tuning of the Voltage Regulator has been satisfactorily performed.

Further testing and evaluation is required to assure proper operation of the URAL after the unit is restarted and the generator is online. A review of effects on plant systems and components as well as a simulator demonstration was performed prior to implementation of this testing. This testing is in progress at this time with completion tracked by action item 249-180-95-01702.

Generator, exciter and amplidyne collector rings and brushes were inspected for abnormalities. Although some wear was observed on the outer exciter ring, this condition was acceptable and would not have resulted in a generator trip. Main Generator brushes were inspected and approximately 30 brushes were replaced. No conditions were observed which would have caused a trip of the generator.

An inspection of generator exciter field breaker, exciter rectifiers, and voltage regulator cabinets revealed no apparent damage.

Continuity testing on the Main Generator Field, and the Exciter Field was performed. No indication of damage was noted.

Bridge and Megger testing was performed on the exciter stator. No apparent cause of the trip or indications of damage were noted.

Exciter compartment Bridges were isolated and load tested. While no load test abnormalities were noted, corrosion on the 5 pole rectifier disconnect switches required cleaning. Also, six termination screws in the exciter cabinet were found loose and were tightened. These conditions would not have contributed to the failure.

The Manual Voltage Regulator Sensing Bridges and Output Bridges were

load tested. No abnormalities were noted during testing.

Main Generator Potential Transformer Fuses were inspected for condition as well as possible bad connections. No abnormalities were noted. High side fuses were cleaned and reinstalled. Low side fuses were replaced.

A review of recent work performed on components in the Exciter and Voltage Regulator was performed. No discrepancies were noted which would have contributed to the trip.

PRV 3-1201-180 setpoint was adjusted to the proper value for Unit 3. The Unit 2 counterpart will be checked and set prior to startup from the present refueling outage. This will be tracked by action item 249-180-95-01703.

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A program is being developed to examine relief valve setpoints. Further actions to prevent recurrence will be developed in accordance with this program. This action will be tracked to completion by 249-180-95-01704.

F. PREVIOUS OCCURRENCES:

LER/Docket Numbers Title

None

G. COMPONENT FAILURE DATA:

Manufacture Nomenclature Model/Part Number

General Electric Resistor 20,000 ohm

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Commonwealth Edison Company
Dresden Generating Station
6500 North Dresden Road
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Tel 815-942-2920

ComEd

October 25, 1995

PGHLTR 95-0025

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Licensee Event Report 95-017, Docket 50-249, is being submitted pursuant to 10CFR50.73(a)(2)(iv), any event which results in a unplanned manual or automatic actuation of any Engineered Safety Feature (ESF) including the Reactor Protection System (RPS).

Sincerely,

P. G. Holland
Regulatory Assurance Supervisor

PGH/DS:cfq

Enclosure

cc: H. Miller, Regional Administrator, Region III
NRC Resident Inspector's Office
File/NRC
File/Numerical

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